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Determination of Contribution of Department of Forest-Village Relation's Projects (DoFVR) Implemented which is Purposed for Reducing Firewood Consumption (Case Study; West Mediterranean and Western Black Sea Regions)

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Abstract

Studies which assess the economical contributions of practices of Department of Forest Villages Relations (DoFVR) to the region or nation is of a limited number. In order for DoFVR to develop its policies, it is necessary to identify the economical contribution of its practices at the local, regional and national level.

To create awareness of the economical dimensions of the DoFVR Solar Energy Systems practices, by assessing its contributions to the economy of the local, regional and national economy.

The study takes within its scope the economical contributions of the DoFVR Solar Energy Systems implemented in the forest villages in Turkey by taking into consideration the data from the forest villages of the Western Mediterranean Region.

Written resources regarding the topic was obtained from related public organisations and institutions by the screening method. Unique data was collected with questionnaires developed for face to face interviews. The SES practices were implemented for 3,447 families in a total of 152 forest villages in the Western Mediterranean Region. A sample of 15-20% of the population of each village with the SES was obtained. In additional a survey was conducted with 314 enterprises in the West Black Sea Region.

These samples details; A face-to-face survey was conducted with a total of 157 firms in the West Black Sea Region, 133 of which made sheathing during the period 2012-2015 and 24 of which applied Room heater and stove with oven. A total of 2,590 SES implementations were made in this region in 2010-2015. It was aimed to sample an equal number of families from both groups in order to compare the firewood savings of the companies in the scope of SES implementation for firewood saving, supported with sheathing, stove with oven and room heater. For this reason, 157 families/enterprises benefiting from SES support were sampled as well as another 157 families/enterprises benefiting from sheathing, Room heater, and stove with oven support.

According to the number of families for which the SES was implemented in the forest villages of the region between 2005-2011, the practice leads to a total annual saving of 10,800 stere. The SES practice has been implemented nationwide to 145 thousand families. According to this, the total annual contribution for the nation is 454 thousand stere. This amount shows that there is approximately an annual saving of 340.5 thousand m^3 of wood.

Key Words: DoFVR Solar Energy Systems, sheathing, stove with oven and room heater practices, contribution of firewood on the economy, cost-benefit analysis.

INTRODUCTION

Increasing demand for energy in the world is accompanied by technical, economic and ecological problems. The estimates of the International Atomic Agency (IEA) indicate that energy requirements in the world will increase by 55% between 2005 and 2030. The largest share of this increase will be in fossil fuels, i.e., petroleum, coal, and natural gas at 84%. According to the IEA, it is expected that the share of renewable energy sources, excluding hydropower, which is 2% in electricity generation today, will reach 6% in 2030. This increase in clean energy resources, expected only in electricity generation, is an indication of what important role they will play in coming years.

According to the World Bank estimates; the commercial volume of the solar energy industry will be 4 trillion USD over the next 30 years. As an insufficient country for non-renewable fossil fuels, Turkey is 70% externally dependent on energy, which import of electricity, natural gas, oil and high-quality coal every year, which is worth billions of dollars. However, Turkey has a very strong potential both regarding solar and wind energy (Anonymous, 2014/a; Anonymous, 2014/b).

Due to its geographical position, our country is quite fortunate regarding solar energy potential compared to many countries. According to the work done by EIE based on the data of sunlight duration and radiation intensity measured in the General Directorate of State Meteorology Affairs in 1966-1982, the average annual total sunshine duration of Turkey is 2.640 hours (7,2 hours per day), the annual average of lightning intensity is 1.311 kWh/m^2 (total of 3.6 kWh/m^2 per day). Following this work, Turkey's Solar Energy Potential Atlas (SEPA) work was completed in 2008, and the thematic map images of the results were published on the GDoRE web page. As a result of the updated measurements, the average daily lightning value on the horizontal surface was calculated as 4.14 kWh/m^2 and the average annual sunshine duration was 2.740 hours (GDoHW, 2013; GDoRE-WEPA, 2007; GDoRE-SEPA, 2010; Ministry of Development, 2012)

A medium hot water system that uses solar energy avoids 11.4 barrel oil spending per year or saves fuel equivalent to fuel that a mid-size sedan car will spend in 20,000 km (Temiz Dünya Rehberi/Güneş Enerjisi, 2013).

The renewable energy field is also important in terms of bringing new business opportunities as well as economic and environmental benefits provided by preferred of this sector. The preference for renewable energy investments makes employment potential in the process of project development, construction-building, and assembly, operation and maintenance-repair. Also, employment is created in the process of developing the manufacturing and labor skills of machinery, materials and industrial products that this preference requires (Yılmaz, 2014).

Estimates of the developments in the energy sector are projected to increase substantially in parallel with the increase in the share of renewable energy in the coming years. The most comprehensive report to date on "green jobs", prepared by UNEP/ILO/IOE/ITUC, suggest that as a result of strong sector support, it is estimated that by 2030, 12 million people are expected to be employed solely in the biomass-related agriculture and industry, 3.3 million in solar energy and 1.2 million in wind energy (UNEP/ILO/IOE/ITUC, 2008).

In our country, plans and estimations related to the employment in the renewable energy sector have been established. According to different scenarios, it is predicted that the annual employment in solar energy will vary between 5,000 and 8,000 persons/year. This situation is predicted to be between 800 and 1300 person/year in the production of biomass energy (Yılmaz, 2014).

In the country energy policies; There are different methods available to increase the use of solar energy systems. These methods are divided into three groups. (i) Economic incentives to overcome investment barriers and increase cost efficiency (direct subsidies, low interest loans, third-party financing) (ii) The necessary arrangements for new or renovated constructions equipped with solar

energy systems, (iii) Strategies for increasing the quality of equipment by using quality labels and technical standards (Menanteau, 2007).

China and India are countries with huge growth dynamics for the expansion of solar energy systems market. In China, the distribution of solar-powered water heating systems has suddenly been increased through market forces and free competition. The primary role that the government plays in this case is to make the industry to has quality labels and standards, giving consumers confidence and ensuring the continuity of these standards. A similar situation has been experienced in India. Solar energy systems quickly entered the competition with traditional water heating systems. The most important hurdle in this country is finance, which can only be mitigated by the use of low-cost micro-credits (Menanteau, 2007).

For another example; Algeria has a major program aimed at the development of different sectors of solar energy systems. Algeria uses 40% of the fossil fuels produced in the country in its domestic market, and 98% of its national exports are fossil fuels. However, the fact that oil prices are low in this country is the most important obstacle to the development of such projects. The most important support is the government subsidies for such projects. Algeria has the largest sunshine area in the Mediterranean countries. While there are 3,900 sunny hours in the Sahara desert, this number is about 2,000 hours in the Algerian ecology. The country has 2.263 kWh/m^2/year in the south and 1.700 kWh/m^2/year in the north. The estimated total energy is 169,400 TW hour/year. This number covers the country's annual energy requirement 5,000 times (Mounir, 2013). With the request of the Albanian government, UNDP and GEF-supported work has been initiated since 2009 to increase solar-powered water heating technologies. In the project which will be realized by the Ministry of Economy, Ministry of Trade and Energy, and the Ministry of Environment, Forestry, and Water in cooperation with UNDP, it is requested to reach an area of 520.000 m^2 by the year 2020 with an annual collector area of 20.000 m^2. By using solar energy for water heating instead of electricity, a cumulative total of about 800,000 tons of CO^2 greenhouse gas will be reduced by 2020 (UNDP, 2013).

Especially in the last two decades, solar water heating systems in China have become a developed industry. The data show that the water heating capacity by using the annual solar energy is two times higher in China than Europe and four times higher than North America. Studies on the spread of water heating systems with solar energy in China is perceived as a social project to contribute to social sustainable development by reducing electricity consumption (Wang,and Zhao 2006). In Jordan, about 12% of households use the solar energy system for water heating. In the comparison of traditional water heating methods and solar energy systems financial evaluation, net present value and internal rate of profit methods are used. Socio-economic evaluations display earnings and losses, considering financial, social, cultural and ecological impacts. The most commonly used method in socio-economic evaluations is a cost-benefit analysis. Several constraints have been observed in the cost-benefit analysis of solar energy water heating systems and in the financial evaluation methods. These constraints are the problem of the income calculation, the interest rate to be deducted for the discount, the problem of cost calculations for solar water heating systems, the estimation of the service life or components of the solar water heating system. As a result of evaluation of central heating (petroleum products), tube usage, kerosene, electricity usage and solar energy systems by Analytical Hierarchy process, solar water heating system was found to be the cheapest type heater. As a result, we can say that the solar water heating system is the most desirable system for use in Jordan (Mohesen, and Akash, 1997).

Projects initiated by DoFVR to reduce firewood have results such as; carbon sequestration, reduction of greenhouse gas emissions and contribution to the country's economy in the energy sector. In the meantime, it is seen that there is also a dimension which constitutes new employment fields, in particular, the contribution to rural development. This initiation of DoFVR is also an important step

for future processes. Since its establishment, which has been over 40 years, DoFVR has tried to support forest villagers with both economic and social credit implementations. The effects of economic and social credit practices on the quality of life of forest villagers have been revealed through various scientific researches (Coşgun et al. 2009, Coşgun et al. 2007; Çağlar, 1986; Istanbullu, 1978; Geray and Acun; 1980; Sakman, 1974). Examination of the problem of supplying the need for firewood from forests and discussions on this side allows DoFVR to develop heat-saving projects in 2000s. Data was obtained from the realized projects to determine in what amounts the consumption of firewood has taken place (Tolunay, 1992; Tolunay, 1998, Önal, 2010; Okutucu et al. 2012; Türker, 1992; Türker and Toksoy, 1992; Ay and Tolunay, 2012; Coşgun, 2017/b)

The Solar Energy System (SES) project by DoFVR, which aims to mitigate the oppression on forests through firewood saving, has become rapidly widespread (Coşgun and Güler; 2015). Project for heat insulation in residential buildings has started to be implemented since 2014. However, the high cost of this project for forest villagers has emerged as the most significant obstacle to widespread adoption. For this reason, it is crucial to obtain new arguments for the extensification of the heat insulation project in the houses. Focusing on the economic and ecological gains of the implemented projects, contributions to greenhouse gas emissions, etc., and making these a policy of the country will be an important influence on the extensification of such projects. These approaches will also contribute to the extensification of project implementations by obtaining support from international funds.

DoFVR has applied SES since 2005 and sheathing, stove with oven or room heater projects since 2014 to reduce the pressures on forest areas by reducing the use of firewood from forests which are living environments of forest villagers in in the West Black Sea Region (Figure 1).

The aim of the work: It is to raise awareness about the economic aspects of the practices through the assessment of the contribution of DoFVR SES implementations for saving firewood at local, regional and country level. **Scope:** It includes firewood saving aspects of SES, sheathing, stove with oven and room heater implementations developed by DoFVR in forest villages in the West Mediterranean Region and West Black Sea Region.

In the study; savings from DoFVR firewood saving project implementations were evaluated in terms of i) quantities of wood raw materials and ii) lignite coal equivalents for thermal energy values.

MATERIAL AND METHOD

The written sources related to the subject have been obtained from the public institutions and organizations through source searching method. The original field data were obtained by face-to-face survey method using prepared questionnaire. SES implementation was made to 3,447 families in 152 forest villages in the West Mediterranean Region (Figure 1). In each village, 15-20% of the total assets of SES-implemented enterprises are sampled. A face-to-face survey was conducted with a total of 157 firms in the West Black Sea Region, 133 of which made sheathing during the period 2012-2015 and 24 of which applied Room heater and stove with oven. A total of 2,590 SES implementations were made in this region in 2010-2015. It was aimed to sample an equal number of families from both groups in order to compare the firewood savings of the companies in the scope of SES implementation for firewood saving, supported with sheathing, stove with oven and room heater. For this reason, 157 families/enterprises benefiting from SES support were sampled as well as another 157 families/enterprises benefiting from sheathing, Room heater, and stove with oven support. Thus, a survey was conducted with 314 enterprises in the West Black Sea Region.

General Directorate of Forest hasn't got enough standard data that fuelwood productions both general region or local region. This reason, internal rate of return and net present value analysis hasn't been calculation. But DoFVR's scial projects has enclosed cost benefit analysis. DofVR calculates the cost and benefit analysis in social project planning according to estimates. However, the ORKÖY does not

control the cost-benefit analysis calculated after the project implementation. Therefore, the post-implementation cost-benefit analysis of the projects is not monitored. For this reason; it was necessary to calculate and compare the benefit-cost analysis calculated by the ORKÖY for social projects and the cost-benefit analyzes obtained from post-implementation survey data. Once and for all; Two benefit cost analysis was compared. one of them the benefit costs calculated when planning ORKÖY projects are the cost-benefit analysis, and the other is the cost-benefit analysis of the data collected after the survey.

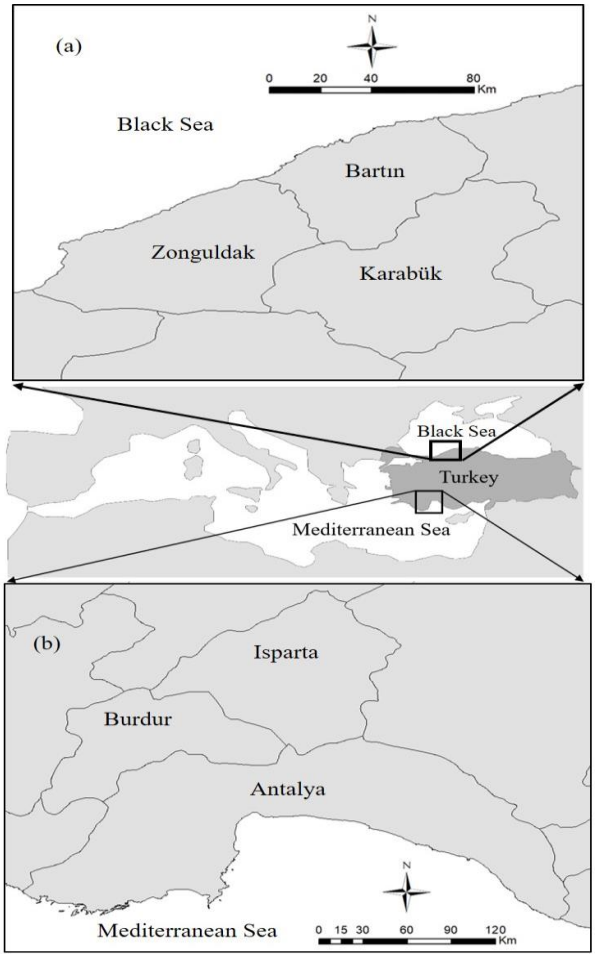

Figure 1: Study Areas; a) Western Black Sea Region, b) West Mediterranean Region.

RESULTS AND DISCUSSION

The SES implementations of DoFVR, the sheathing, the Room heater and the stove implementations were evaluated based on the context of the West Mediterranean Region and the Zonguldak Forest Regional Directorate of Forestry in the West Black Sea Region. In this scope; the contributions of wood-saving provided by these implementations were presented in the regional and national basis according to the results of two regions. The obtained savings were compared under the two main headings as the wood raw material costs and the thermal energy values.

Saving of Firewood in West Mediterranean Region

The use of SES in the forest villages of the West Mediterranean Region showed that 25-30% of firewood was saved. The consumption of wood per average household in the forest villages of the

West Mediterranean region is about 12 steres. When saving is evaluated as 30%, 3,522 steres fuel savings per household was achieved. Considering the amount of annual firewood purchased by the forest villagers from the forestry administration, the total annual firewood savings become 3,1311 steres (Coşgun, 2017/a). According to the number of the SES provided for families in forest villages in this region during the period of 2005-2011; the total annual contribution of the implementation is 10.800 steres (Coşgun and Güler; 2015).

Between 2005 and 2015, a total of 145 thousand households were benefited from SES throughout the country. According to West Mediterranean Region data; the total annual contribution to the country is **454 thousand steres**. This amount indicates that the firewood saving is about **annual 340,5 thousand m^3 of wood raw material**. In the West Mediterranean Region, Antalya Regional Directorate of Forestry, the amount of annual firewood production for the years 2007-2009 was announced as 455 thousand steres. For the same years, the amount of firewood for Isparta Regional Directorate of Forestry was stated as 58 thousand steres (Anonymous, 2009). The annual firewood savings is equivalent to the amount of annual firewood in the Antalya Regional Directorate of Forestry and 7.8 times much more than the annual firewood production in the Isparta Regional Directorate of Forestry.

Saving of Firewood in West Black Sea Region

As a result of examining DoFVR implementation in the Zonguldak Regional Directorate of Forestry; annual firewood consumes for activities such as food, cooking, bathing, etc. in the families benefiting from credit facilities including i) Heating, ii) Stove with oven, and iii) Solar Energy Systems was determined as the average 18.3 steres wood together with 2.31 tons of coal (Coşgun, 2017/a). According to Coşgun (2005), the annual consumption of wood in the West Black Sea region in the second half of the 1990s was 35,8 steres.

a) Contributions of DoFVR SES Projects to the Wood Consumption in the Region; Utilizing DoFVR SES project implementation has also become widespread in forest villages of The Zonguldak Regional Directorate of Forestry, which forms the Western Black Sea region. Families benefiting from SES have often stated that they can benefit more from this project in the summer months. In general, it is used after gardening, vineyard and animal husbandry. Wood saving for families benefiting from SES support in the region was 32.0%. In the Western Black Sea Region, DoFVR SES practices have resulted in saving 5.9 steres wood per household. With the support given to a total of 2950 houses/businesses during the years 2010-2015, has resulted in annually a total of **17,257 steres**, approximately **12,943 m^3** wood savings, from 2015 to the present day.

Considering that SES implementation has been carried out with a total of 145 thousand families throughout the country in 2005-2015; the total annual contribution to the country has been 855,500 steres according to the data of the Western Black Sea Region. This amount indicates that firewood saving is approximately **641,625 m^3 of annual raw wood**.

b) Contribution of DoFVR Sheathing Projects to the Wood Consumption;

The savings rate of the annual wood consumption of the families by the sheathing support was 52.78%. It has been tried to find out which implementation saves more wood in the families who have benefited from the implementation of the SES project together with the implementation of the sheathing project or who have obtained the SES implementation by their own possibilities. Annual firewood savings in families benefiting the combination of sheathing and SES implementations showed that the sheathing project saved more money than SES implementation. The sheathing project implementation saved an average of 61.57% more firewood savings compared to SES project implementation.

Within the scope of Zonguldak Regional Directorate of Forestry, 1.290 steres firewoods have been saved with this DoFVR project (sheathing project). This project has been implemented to 1001

companies/families throughout the country in 2012-2014 (Anonymous, 2015). In this case, approximately **9,710 steres firewood, 7.283 m3 wood raw material** savings have been realized.

c) Contributions of DoFVR Stove with Oven Projects in the Western Black Sea Region to Wood Consumption; "stove with oven" implementation was realized in forest villages (24 in Yeşilöz and Tohumlar villages) of Eğerci, Dirgine in Zonguldak provinces. This implementation has emerged in two ways in practice. Considering the use of firewood in the activities of the families throughout whole year, it was seen that "room heater" or "stove with oven" project implementations achieved 25,45% more firewood savings compared to SES project implementation. This low ratio is due to the absence of exterior insulation of houses. On the other hand; The average annual fuel savings of the families benefiting from DoFVR "room heater" or "Stove with oven" projects was 31.3% on average.

Within the scope of Zonguldak Regional Directorate of Forestry in the Black Sea Region, DoFVR's "room heater" or "stove with oven" project implementations saved firewood of 137 steres. This project has been applied to 69 enterprises/families throughout the country in 2012-2014 (Anonymous, 2015). In this case, total firewood savings were approximately **393 steres firewood or 295 m^3** wood raw materials.

d) Contributions of DoFVR Projects in Western Black Sea Region to the Total Wood Consumption; Within the Western Black Sea region, a total of 10.103 steres of firewood savings was realized with the sheathing, stove with oven and room heater implementations. When this number is included in SES savings, a total of **865,603 steres or 649,203 m^3** firewood savings were realized annually. Considering that the average amount of annual firewood between 2007-2009 of Zonguldak, Kastamonu and Bolu Regional Directorates of Forestry constituting West Black Sea Region Directorates is 780.616 steres, saving firewood made by DoFVR projects is 11.0% (85 thousand steres) higher than the amount of annual producing of firewood of these 3 Forest Regional Directorates (Anonymous, 2009).

Cost-Benefit Analysis of DoFVR's Social Projects

Cost-benefit ratio (C/ B) is included in the economic analysis of the projects. According to this; stove with oven and room heater C/ B ratio was 1,41, sheathing project C/B ratio was 1.44 and SES ratio was 1.77 as calculated. According to the results obtained from the survey data after the project implementation; stove with oven and room heater C/ B ratio was as 0.92, sheathing project C/ B ratio was 1.06 and SES Cost-Benefit ratio was 1.82 as calculated. According to the data obtained after the implementation of these three projects with the DoFVR social content, the stove with oven and room heater should not be implemented. The costs incurred for the preparation of the project for the calculation of the cost-benefit ratio, for example; working expenses of the project team, vehicle, stationery etc. were not included. Considering the inclusion of these expenses in the project, the ratio will be smaller. İn this situation C/B rate in the sheathing project will be less than 1 and this project will not be economical to implement.

Evaluation of energy contributions of DoFVR projects implementations

There are important studies about the contents of the wood raw materials, energization of the forest products in our country. In coniferous trees, the mean calorie value of the branch wood is 5.018 Kcal/kg and in broadleave trees, it is 4.620 Kcal/kg (Erten and Önal, 1985; Bozkurt, 1972).

Assessment of Energy Contributions of DoFVR Implementations in the West Mediterranean Region

According to the annual wood saving provided by the SES project implemented in the West Mediterranean Region; 10.800 steres wood (if the ster weight is taken as 350 kg) is calculated as 10.800 X 350 = 3.780.000 kg. If the average calorie value of coniferous trees is taken as 5.018; energy

saving has been achieved as 3.780.000 X 5.018 = **19 billion Kcal/kg (18.968.040.000 Kcal/kg).** If the West Mediterranean Region SES data is associated with implementations across the country, the energy provision of saving firewood will have arisen. With the SES carried out in the country with 145 thousand families, a total savings of 454.000 steres firewood was obtained. This results in 454.000 X 350=158.900.000 kg wood. The energy reserve of this amount is 158.900.000 X 5.018 = 797 billion Kcal/kg (**797.360.200.000 Kcal/kg**). Assuming that 1 house in rural area consumes 200 KWh/month, and assuming that a biomass power plant produces 25% efficiency, a power generating plant of 5 MW can meet the electricity need of about 4,000 houses. To operate these plants, firewood or woody biomass from roughly 80,000 steres trees per year is required (Pelkonen et al., 2001). These values are taken into account across the country, the energy which can be produced by 5.7 power plant of 5 MW power (454.000/80.000=5.7) can also be saved with the annual firewood savings. This refers to an energy saving to meet the need for electricity of approximately 22 thousand houses. At the same time, this saving corresponds to the energy to be obtained from at least 2 of 10 MW hydroelectric power. In other news; lignite coal calorific value is defined as the calorific value of coal having below 17 MJ/kg (this value 4.165 Kcal/kg is taken as 4000 kcal/kg) (Anonymous, 2017). If all region is taken into account, the savings that are equal lignite coal of 4.742.010.000 Kcal/kg (18.968.040.000/4000 Kcal/kg) occurs. Taken into consideration whole country, an equivalent fuel saving of 199,340,050 Kcal/kg coal (797,360,200,000/4000 Kcal/kg) has been achieved. The annual imports of coal are 20 million tons (Anonymous, 2017). Approximately 1% of the annual amount of coal imports is obtained by firewood saving.

Evaluation of energy contributions of DoFVR implementations in the Western Black Sea Region

In the Western Black Sea Region, DoFVR applied SES as well as sheathing, stove with oven and room heater project implementations. For each project, the amount of energy obtained through firewood saving is presented. **a) For SES project implementation;** When taken into consideration the annual wood saving provided by the SES project; it is 17.257 steres wood, in other words, 17.257. X 400 = 6.902.800 kg (if the steres weight is accepted as 400 kg). The use of firewood is mostly obtained from broadleaf trees when we take the average calorific value of leafy trees as 4.620, it appears that energy saving of **31.9 billion Kcal/kg** (6.902.800 X 4.620) has been made. When the number of SES implementation projects in the country is evaluated with the data of West Black Sea Region, the amount of energy is observed as much different. When the average ster weight of 855,5 ster wood is 400 kg; it concludes as 855.5 X 400 = 342.200.000 kg. Assuming that 1 kg of leafy wood gives 4.620 Kcal energy, 855.500 X 400 X 4.620 = 1.580 964.000.000 Kcal/kg energy saving is obtained. The annual amount of coal imports is 40 million tons. In this case, the energy value of lignite coal become 4000 Kcal/kg; energy saving is realized as 1.580.964.000.000/4.000 = 395.241.000 Kcal/kg. It is about 400 thousand Kcal/ton value. The amount of savings obtained by DoFVR SES project implementations in the Western Black Sea Region constitutes approximately 1% of the imports. **b) For Shealting implementation;** With the implementation of sheathing, 1.290 steres firewood has been saved in the region. This project has been implemented in 1.001 companies/families throughout the country in 2012-2014 (Anonymous, 2015). In this case, the total firewood savings was approximately **9,710 steres** (1 stere leaved wood is calculated as 400 kg). Considering that the energy value of firewood is 4.620 Kcal/kg; 9710 X 4.620=44.9 million Kcal/kg (**44.860.200 Kcal/kg**) equivalent energy reserve has been saved. **c) For stove with oven and Room heater project implementations;** "Room heater" and "stove with oven" project implementations saved **137 steres firewood.** This project has been implemented in 69 business/families throughout the country in 2012-2014 (Anonymous, 2015). In this case, the total savings of firewood has been approximately 393 ster firewood. Considering the energy value of the leaved wood; 393 X 4.260 = 1.7 million Kcal/kg

(1.674.180 **Kcal/kg**) equivalent energy savings have been achieved annually. **d) Evaluation of Total Energy Contributions of DoFVR Implementations in West Black Sea Region;** A total of 865.603 steres firewood savings have been realized from SES, sheathing, stove with oven and room heater projects implemented by DoFVR in the Western Black Sea Region. 865.603 X 400 X 4.620 = 1.6 trillion Kcal/kg (1.599.634.344.000 Kcal/kg) equivalent energy saving is achieved.

Assuming that one house consumes 200 kWh/month in a rural area, and assuming that a biomass power plant produces with 25% efficiency, a power generating plant of 5 MW can meet the electricity need of about 4,000 houses. To run these plants, firewood or woody biomass from roughly 80,000 steres coniferous trees per year is required (Pelkonen et al., 2001). Through DoFVR project implementations in the Western Black Sea Region, firewood savings is a total of **865.603 steres**. When these values are taken into consideration, 865.603 / 80.000 = 10.82 plants at 5 MW power can be operated. With the operation of these plants, annual energy needs of 43,200 houses can be met in rural areas. It can correspond to a size equivalent to the size of a district in Central Anatolia. This value corresponds to the energy that can be obtained from at least 5 Hydro Electric System (HES) at 10MW power.

Evaluation of DoFVR Implementations

It is also seen some contradictions between new term project implementations of DoFVR and General Directorate of Forestry (GDoF) policies. Saving firewood can be seen in the basic policies of DoFVR in 2005. The 2009 "Bioenergy Working Group Report" on "Status of Forest Bioenergy for Renewable Energies" of GDoF looks differently on the issue of firewood. It seems to be related to the principle of wider participation of the firewood used in the energy sector (Anonymous, 2009). Again, in the study, it is suggested that "a protocol should be made to give incentive credits to small capacity power generation facilities that can be installed in forest village or for stove fired with briquette and litter by DoFVR". In the Target section of the report; "Providing the forest villagers' heat and electricity from wood" is mentioned. (Anonymous, 2009). It can be seen that DoFVR SES, sheathing, stove with oven and room heater implementations are in opposition to these suggestions.

It is also mentioned about the approaches to obtain energy from the wood, which GDoF is one of the parties. Referring to the European Union Biomass Action Plan 2005, in the 2005 European Union Joint Action Plan following issues are proposed;

- Biomass usage to be doubled by 2010,
- CO_2 reductions equivalent to 209 metric tons of greenhouse gases annually in 2010,
- Employing nearly 300,000 people in 2010,
- Reduction of imported energy dependency by up to 6%

Approaches to the use of wood as a fuel energy source are also emphasized (EU, 2005).

This report of the GDoF in 2009 clearly shows that it follows the policy of "Energy Forestry" principle and benefiting from the raw materials of the wood (body wood, branches and crustwood and carcass remnants, etc.) for the purpose of energy. After the reorganization of the GDoF in 2011, there seems to be no change in the DoFVR policies towards the above-mentioned understanding. Moreover, as in the whole country, the ongoing SES, sheathing, and stove with oven implementations must be maintained in Zonguldak Regional Directorate of Forestry, and these show that top management units and/or decision makers in the GDoF are not in coordination with each other.

CONCLUSION

DoFVR has made new implementations, especially in project development with social content in order to save firewood. In particular, the SES project initiated in 2005 has rapidly become widespread throughout the whole country.

DoFVR has not yet revealed the amount of energy and its monetary value obtained through firewood saving. The thermal insulation project developed in recent years has emerged as a high-cost project. Forest villagers do not dare to get it due to high cost. For this reason, it has not spread as rapidly as SES.

As seen in this study conducted in the West Mediterranean and West Black Sea Regions, there are significant savings differences between regions. For this reason, it is necessary to see more of the data with regional/topical surveys and the whole picture of the country.

Within the dimensions of saving made by DoFVR thermal insulation projects; comparison with coal imports for the energy required by the industrial sector is meaningful to determine the advantages of the applied project. It is important that the energy savings provided from the projects are 1-2% of annual coal imports. Particularly if sheathing, room heater, and stove with oven implementations become as widespread as SES implementation, the sizes of the contribution to be obtained will reach much higher levels.

The economic dimensions of the amount of savings that can be achieved through thermal insulation applied in forest villages should be assessed on the basis of the contribution of forests to the country's economy.

Another issue that needs to be assessed is the economic and ecological contribution of the stopping the deterioration of forest ecosystem structures. Unconsciously exploiting the forests for daily needs of forest villagers living in forests causes the equilibrium in forest ecosystems to deteriorate rapidly. The costs of recovering the degraded ecological balance should also be considered as a reflection of these project implementations. That is why; the reduction of pressure on forest area through the savings of firewood should also be mentioned with Ecological Impact Assessments.

In addition to the social and economic dimensions of the savings of firewood realized by DoFVR, there are also dimensions for carbon emissions. Almost no mention has been made about this subject yet within the context of the contributions of the projects.

GDoF and DoFVR decision makers are unfortunately unaware of the social and economic impacts of the firewood saving projects. The implication of such awareness is the formation of intense demands to determine the amount of savings at the regional and local level of the implemented projects. But there has not yet been a demand for this issue.

It is also seen that there are some contradictions between DoFVR's new term project implementations and GDoF policies. In 2005, DoFVR announced one of its basic policy to realize firewood savings. The 2009 "Bioenergy Working Group Report" on "Status of Forest Bioenergy for Renewable Energies " of GDoF looks differently on the issue of firewood.

"Protocols to grant incentive credits to small capacity power generation facilities that can be installed and for litter or briquette burning stoves through DoFVR" has been determined and it is emphasized that "supporting forest villagers to obtain the heat and electricity from the wood" in the target section of the report. With these approaches, it can be seen that DoFVR SES, sheathing, stove with oven and room heater implementations are in opposition.

In the economic analysis of DoFVR social-purpose projects, it is not enough to make a cost-benefit analysis. İnternal rate of return and present value analysis should be performed. The economic analyzes carried out during the planning of social projects should be repeated after taking the project results into consideration. Considering the implementation results, these social projects should be temporarily halted if economic analysis values remain at low levels. The source of the data in practice should be re-examined and the economic analyzes should be reviewed again.

It clearly seems that top management units and/or decision makers in GDoF cannot provide coordination in terms of basic policies.

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REFERENCES

Anonymous, 2009; Tthe Status of Forest Biomass in Renewable Energy, Bio Energy Working Group Report, Ministry of Environment and Forestry, General Directorate of Forestry, Ankara

Anonymous, 2014/a; General Directorate of Renewable Energy (GDoRE), Renewable Energy Resources Support Mechanis,Ankara.

Anonymous, 2014/b; General Directorate of Renewable Energy (GDoRE), Solar Energy and Technology Studies, Ankara

Anonymous, 2015; General Directorate of Forestry, Department of Forest Villagers Affairs, Forest Villagers Affairs Distribution of Loan implementation by Sorts for provincials, Ankara

Anonymous, 2017; General Directorate of Turkey Coal Enterprises, Coal Sector Report (Lignite)-2016

Ay, S., Tolunay, A., 2012; The Effect of Using of Solar Energy Systems on Fuelwood Consumption of Household in Forest Villages (Case study Forest Villages in Burdur Province-BucakTown), The 3rd National Congress on Socio-Economic Problems in Forest, İstanbul..

Bozkurt, 1972; Fuelwood Specification and Their Value of Calorie, Journal of The Faculty of Forestry Volume B, Issue:22, pages: 58-70, İstanbul.

Coşgun, U.;2005: Socio-Economic Structure of Forest Villages of Western Black Sea Region and Determination of Socio-Economic Factors Effected on Development of These Villages by Using the Multi Numerical Analyses Method, The Western Karadeniz Forest Research Institute Publications, Technical Bulletin Number: 11, 2005, Bolu.

Coşgun, U., Bekiroğlu, S., Telek, A.; 2009. "Determination of Efficiency at the Level of Agriculture Development Cooperatives in Forest Villages (Case Study in Antalya)", Southwest Anatolia Forest Research Institute Publications, Technical Bulletin Number: 46, ANTALYA.

Coşgun, U., Ok, K., Yılmaz, E., Telek, A., Ay, Z., Uzun, E.; 2007. "Determination of Forest Village's Priorities in Allocation of DoFVR Resoruces (Case Study in Antalya), Southwest Anatolia Forest Research Instıtute Publications, Technical Bulletin Number: 28, Antalya

Coşgun, U., Güler, K. ,H., 2015; Evaluation of Solar Energy Applications Results by DoFVR, (Case Study: Forest Villages in Southwest Anatolia Region), Project Final Report, (unpublished).

Coşgun, U., 2017/a; Evaluation of ORKÖY's Heat Insulation and Stove Heating Project (Case Study: Zonguldak Forest Regional Directorate), International Symposium on New Horizons in Forestry, 18-20 October, Isparta.

Coşgun, U., 2017/b; Evaluation of Solar Energy by the General Directorate of Forest-Village Relations in the Southwest Region of Anatolia, Journal of Environmental Biology, Special issue September 2017 Vol. 38 961-969

Çağlar, Y.; 1986. The Events Related to Development of Forest Villagers in Turkey, National Productivitiy Center issue: 340, Ankara.

GDoHW, 2013; General Directorate of State Hydraulic Works (GDoHW), Rewives, 01 february, 2013, Ankara.

GDoRE-WEPA, 2007; General Directorate of Renewable Energy (GDoRE), Wind Energy Potential Atlas, Ankara

GDoRE-SEPA, 2010; General Directorate of Renewable Energy (GDoRE), Solar Energy Potential Atlas, Ankara

Erten and Önal, 1985; Determination of Calorific Value of Native Species Woods and Barks, Forest Research Institute Publications, Technical Bulletin number:147, Ankara.

European Union, 2005; EU Biomass Action Plan.

Geray, U., Acun, E.; 1980. Urbanization of Forest Villagers and Arrangement of Forest Village Relations (Case Study; Safranbolu), Istanbul University Issue: 2640, Forest Faculty Issue: 279, İstanbul.

International Energy Agency (IEA),2012; World Energy Outlook 2012.

İstanbullu, T., 1978; "Investigation on Fuel and especially fuelwood problems in Turkey", Istanbul University Issue; 2405, Forest Faculty Issue: 251, Çelikcilt printery, İstanbul.

Ministry of Development, 2012; Sustainable Development Report for Turkey: "be possess of own future", 2012, Ankara.

Menanteau, P., 2007; Policy measures to support solar water heating: information, incentives and regulations, World Energy Council, ADEME Project on Energy Efficiency Policies,

Mohesen, M., S., Akash, B., A., 1997; Evaluation of domestic solar water heating system in Jordan using analytic hierarchy process, Energy Congress. Mgmt, Vol. 38. No. 18 Great Britain

Mounir, A.,Zouagri, R., Naamane., A., 2013; Technical-Economic Analysis of Solar Water Heating Systems at Batna in Algeria, Chapter 70, Sustainable in Energy and Buildings SIST, 22 p: 787-796, Berlin

Okutucu, M., A., Demir, M., Ağyürek, C., Bilgili, A., Güven, M., 2012; "Solar Energy's Renewable Energy Sources, Research on Implementation Results in DoFVR Projects (Case Study; Erzurum Province)", The 3rd. National Congress on Socio-Economic Problems in Forest, İstanbul.

Önal, P., 2010; "Investigation of Implementation Results of Village Development Projects Performed by DoFVR in Forest Villages (Case Study; Şile-İstanbul)" I.U. Forest Faculty, Department of Forest Engineering Msc.Thesis (unpublished), İstanbul.

Sakman, E.; 1974. Arrangement of Forest Village Relations, Turkey Union of Chambers of Agriculture Publication Number: 99, Olgun Kardeşler Printery, Ankara.

Pelkonen, P., Hakkila, P., Karjalainen, T., and Schlamadinger, B., 2001; Woody Biomass as an Energy Source-Challenges in Europe. Saarijarvi: European Forest Institute.;

Temiz Dünya Rehberi/Güneş Enerjisi, 2013; Guide of Clean World "Solar Energy", Clean Earth Ecology Association, İstanbul.

Tolunay, A., 1992; Why social forestry and how an DoFVR?, Republic of Turkey Ministry of Forestry Journal, 1-5, 14-19.

Tolunay, A., 1998; Importance of Social Forestry for Turkey, İstanbul Universty Graduate School sf Sciences doctoral thesis (unpublished), İstanbul.

Türker M. F., 1992; "Socio-Economic Analysis of the Consumption of Wood from the Forests of Macka State Forestry Directorate Forests for the purpose of Firewood", Karadeniz Technical Universty Graduate School Sciences doctoral thesis (unpublished) Trabzon.

Türker, M. F., Toksoy, D., 1992; Solutions to the Problem of Consuming Wood Raw Materials from State Forests for the Purpose of Firewood Use. Environment Magazine, October, November, December Number 5, Pages; 5-8.

UNEP/ILO/IOE/ITUC, 2008; Green Jobs: Towrads Decent Work in a Sustainable, Low-Carbon Worldi United Nations Environment Programme, Nairobi, Semtember.

UNDP, 2013; The Country program of Albania under the global market transformation and strengthening initiative

Yılmaz, S., A., 2014; Green Jobs in Renewable Energy Field and Potential in Turkey, General Directorate of Social Sectors and Coordination, Republic of Turkey Ministry of Development Issue: 2887, Ankara

WANG, Y., ZHAO, L.2006; Economic Analysis of solar Water Heater in Guang Zhou, Policy for Energy Efficiency and Comfort, Vol.VII-4-4, China

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